PROGRESS REPORTS
FROM
EXPERIMENT STATIONS

SEASON 1954-55

SUDAN

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PROGRESS REPORTS FROM EXPERIMENT STATIONS.

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For the 1954-55 season and subsequently the Progress Reports published in this series will be confined to those from territories in which members of the Corporation's staff are working. For 1954-55 the list will be:—

Cotton Research Station, Namulonge,
Sudan,
Kenya,
Tanganyika—Lake Province,
Tanganyika—Eastern Province,
Nyasaland,
Northern Nigeria
Aden,
West Indies,
Survey of Reports.

SUDAN

COTTON BREEDING STATIONS
PROGRESS REPORT FOR THE SEASON 1954-55

	Planting Dates.	*Picking Dates.*
Gezira	Mid August to mid September.	January to March.
Gash	Late August to late September.	Mid January to April.
Tokar	Early September to mid October.	January to May.
Kordofan	Mid June to mid August.	Mid October to February.
Zeidab	First half May.	September to December.
Equatoria	Mid May to August.	October to mid February.

Introductory Note

BY

M. F. ROSE.

Staff.

Mohammed Eff. Taha El Faki, Inspector Cotton Propagation, was appointed Manager, Barakat Seed Farm, and left the Section to take up his official duties there in March 1955. His post has not yet been filled. Otherwise the staff position remains unchanged.

Visitors.

Dr. J. B. Hutchinson, C.M.G., F.R.S., visited Shambat on 6th December 1954 en route to Entebbe. The current lines of work at the Cotton Breeding Section were discussed with special attention to long range problems.

Mr. P. H. Le Mare arrived at Wad Medani on 22nd January 1955. During his stay in the Sudan he visited Shambat and the Central Research Station, Tozi.

Tours.

Mr. L. C. Hughes toured the Eastern and Western Jebels in late November 1954. He inspected the Cotton Breeding Section at Kadugli and discussed the prospects of the commercial crop in Kordofan with Mr. McEwen, General Manager of the Nuba Mountains Cotton Industry.

Commercial Cotton in the Sudan.

Areas and yields are given below: —

(i) *Egyptian Cotton*

	Area (feddans)	*Yield (kantars)*
Gezira	234,748	1,005,735
White Nile	99,683	426,089
Abdel Magid	9,980	46,461
Gash	41,808	58,765
Tokar	13,483	10,352
	399,702	1,547,402

(ii) *American Cotton*

	Area (feddans)	*Yield (kantars)*
Irrigated	7,041	22,075
Flood (Abu Habl)	3,360	5,800
Raingrown	249,500	302,400
	259,901	330,275

One feddan = 1·038 acres. 1 Kantar = 315 rotls = 312 lb.

During the year there was a rapid expansion of commercial pump schemes (chiefly in the White Nile area) growing BAR XL1. There is every prospect that this area will be increased by a further 25% in the 1955-56 season.

THE GEZIRA STATION

BY

M. F. ROSE AND L. C. HUGHES.

Climate and Crop.

The 1954-55 season showed no abnormal trends and there was every indication that good yields of high quality would be returned. Although June rains were light, rainfall from July 1st to August 15th* was 229·4 mm., 11·1 mm. above the general average of 1919-1942. Establishment of all experimental material was good, although 'untimely' rain following immediately upon irrigation caused some irregularity of stand (see G. R. F. variety trial). October was a comparatively pleasant month with temperatures below normal. However, from November 1st to November 21st very high temperatures were experienced (mean max. = 101·5°F.). Flowering generally was

* The 'July-August effect'

late, owing possibly to October temperatures or more probably to the application of 2N (80 lb. of N. per acre) to the crop†. A cold spell in late December-early January with day and night temperatures down to 81°F. and 47°F. respectively gave the crop a "tucked-up" appearance and during this period much valuable selfed and crossed material was shed. High temperatures in mid January failed to revive the crop and by the third week the crop appeared to have closed down. This was, in fact, the case with Sakel and Sakel derivatives.

Flea beetle and blackarm did little damage to the crop generally although the latter was present in all susceptible material. Leafcurl made its appearance in Sakel on 18th October but had little effect on final yield. American bollworm, however, was much in evidence not only causing extensive shedding in all American types but attacking terminal buds and leaves and giving the plant a fretted, ragged appearance. Whitefly attack was not above average although isolated pockets of very severe infestation could be found throughout the Farm.

Final yield figures and early grades from the whole of the Gezira Research Farm were disappointing, especially for Sakel. Sakel plants appeared to be carrying a large number of small, badly developed bolls with much poor and premature opening. There was some "bronzing" of the lint and strength was poor. Domains Sakel and X1730A averaged respectively 1,078 lb. (43 acres) and 1,932 lb. (125 acres) of seed cotton per acre with mean grade 5·4 and 5·1. Early picks were disappointingly low at X4 and X3.

Relevant meteorological data are given in Table 1, the 1953-54 figures being shown in brackets.

TABLE 1.
METEOROLOGICAL READINGS.
G.R.F. 1954-55.

Date		*Mean Max. F.*	*Mean Min. F.*	*Total Rainfall mms.*	*Average Relative Humidity 8 a.m.*
April	1954	106 (103)	68 (69)	2·5 (3·0)	19 (29)
May	,,	107 (106)	74 (77)	16·3 (45·4)	23 (45)
June	,,	103 (102)	76 (75)	7·5 (40·7)	49 (55)
July	,,	91 (92)	70 (72)	158·0 (84·9)	80 (74)
August	,,	88 (89)	70 (71)	161·7 (158·4)	84 (80)
September	,,	91 (94)	70 (70)	106·7 (28·9)	79 (72)
October	,,	99 (100)	69 (69)	10·1 (15·1)	50 (52)
November	,,	100 (97)	65 (63)	— (—)	30 (33)
December	,,	92 (90)	57 (52)	— (—)	35 (33)
January	1955	92 (95)	56 (55)	— (—)	37 (30)
February	,,	97 (101)	61 (63)	— (—)	37 (26)
March	,,	104 (103)	68 (64)	— (—)	28 (19)
Total				462·8 (376·4)	

† to keep in step with current commercial practice.

Breeding.

(a) Nine hundred and eighty-six single plants from BLR 14/25.3 grown as an out-of-season crop at Shambat and filtered for leafcurl resistance came to the breeding plot for testing (Breeding Stage). With the breakdown of leafcurl resistance in all BLR 14/25 material (in the Gash and Northern Gezira) and with a trend of falling yield with each successive filter at Shambat the treatment of such material was problematic. Tests for homogeneity of seed characters showed variability to be low, as was the case in the previous season within BAR 4/16 and BAR 5/6. In consequence it was decided to short-circuit the Breeding Stage and test for yield potential within the crop.

Two trials were planted on August 15th, a 10^3 cubic lattice and a 9 × 9 lattice square. The two trials were adjacent in the same 5 acre field: 901 progenies of BLR 14/25.3 plus 99 controls of Domains Sakel and Parental Bulk, and 75 progenies of BLR 14/25.3 plus 6 controls of Domains Sakel and Parental Bulk, constituted the two experiments respectively. The results were both surprising and gratifying and are shown in Table 2.

Table 2.

Yield Potential Trials.

	10^3 *cubic lattice lb. lint/acre*	9×9 *lattice square lb. lint/acre*
Efficiency. Random Block: Factorial	100 : 117	100 : 135
Mean yield Domains Sakel	379	390
Mean yield BLR 14/25 Parental Bulk	382	490
Mean yield highest yielding progeny	612	588
Mean yield progeny rows selected	522	506
Number of progeny rows selected	186	40

The seed from 191 lots of the 226 selected will be bulked according to yield potential to give groups 1, 2 and 3: these will be grown in isolation in the coming season. At the same time the 3 groups will be tested against BLR 14/25 Parental Bulk as a further check.

A further 1,000 single plants from BLR 14/25 Parental Bulk were selected at the G.R.F. to constitute a 10^3 cubic lattice in the coming season. Within this material which has suffered no yield deterioration at Shambat still higher levels of yield should be found.

(b) A large scale crossing programme was undertaken with three objects in view: (i) to increase variability within B_2B_3 types of S and L, (ii) to attempt to transfer the inherent resistance to leafcurl disease from the L to the S type, (iii) to obtain an improvement in the

L types carrying B_2 and B_3 which fall below the standards of X1730A and BAR XL1 in both yield and quality.

The following crosses were made (direct and reciprocal)

BLR 14/25 (S type) × BAR 4/16. 48. 62. 66. 106. 7. (L type)
BLR 14/25 × BAR 5/6. 39. 56. 24. (L type)
BLR 14/25 BK × BAR 4/16 BK giving 18 lots of F_1 seed homozygous for B_2 and B_3.

Straight F_2 work will run concurrently with backcrossing.

(c) 154 healthy plants of BLR 14/25.3 were selected from first rotation cotton, Gash, very heavily infected with leafcurl.

These were planted in progeny rows alternating with Domains Sakel and a careful watch was made for the appearance of the disease. The spread was sporadic in the plant cotton but on ratooning (March 5th) heavy infection appeared in all progeny rows and controls.

It would appear that Shambat-bred strains of leafcurl resistant Sakels when grown in the Gash and Gezira are meeting with the same fate as Evelyn's RDS lines (Wad Medani bred) at Shambat in 1950. Leafcurl still remains the major problem and the breeder is probably confronted with different races of the same virus scattered throughout the Sudan.

The immediate problem is that of *controlled* infection. A quick efficacious method must be devised for testing out the genotype in segregating generations. Some success has been achieved at Shambat by budding and grafting but this method failed at Wad Medani owing possibly to the age of the stock.

(d) Lint retention transferences from *G. contextum* to BLR 14/25 and the building up of salt tolerance in BLR 14/25 continues. In the latter case all flowers were brush pollinated.

Testing.

Variety Trials.

(a) The standard variety trials were planted at Turabi (North), the Gezira Research Farm (Centre) and Hag Abdulla (South) on 17th, 22nd and 24th August respectively. The layout was identical: randomized blocks of 7 varieties × 20 replications of plot size 0·0266 acres with spacing 80 cms. × 35 cms.

Excellent stands were obtained in the North and the South but "untimely" rain following establishment irrigation caused patchiness at the G.R.F. and one block was abandoned.

In the North, blackarm and leafcurl were virtually absent, with American bollworm and whitefly major pests: in the South, leafcurl was absent but there was some blackarm on the eastern side of the trial: at the G.R.F., blackarm attack was severe, all susceptible material showing 100% infection.

TABLE 3.

GEZIRA VARIETY TRIALS, 1954-55.

YIELDS OF SEED COTTON AND LINT IN POUNDS PER ACRE.

Variety	*BAR Genes*	*Turabi (North)*			*G.R.F. (Centre)*			*Hag Abdulla (South)*			*Overall Mean*		
		Seed Cotton	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*
S GROUP													
Domains Sakel		1693	553	32·7	1642	514	31·3	1615	515	31·9	1650	527	32·0
BLR 14/25 Shambat	B_2 B_3	1651	518	31·4	2012	602	29·9	1691	514	30·4	1785	545	30·6
BLR 14/25.2 Gash	B_2 B_3	1563	497	31·8	2061	616	29·9	1718	524	30·5	1781	546	30·7
BLR 14/25.3 Shambat	B_2 B_3	1571	503	32·0	2127	634	29·8	1675	511	30·5	1791	549	30·8
L GROUP													
X1730A Gash		1721	613	35·6	2099	720	34·3	2043	715	35·0	1954	683	35·0
BAR XL1 Gash	B_2	1782	652	36·6	2159	738	34·2	2088	725	34·7	2010	705	35·2
BAR XL3 G.R.F. Store	B_2	1707	604	35·4	2247	766	34·1	1979	687	34·7	1978	686	34·7
Standard Error (Mean)			11·0			12·9			13·1				
Difference = 0·05			30·9			35·2			36·7				

Final yields at each site followed closely the previous year's pattern with L types significantly outyielding S types. In the North (blackarm absent) Domains Sakel outyielded BLR 14/25 and derivatives: at the G.R.F. (blackarm severe) BLR 14/25 outyielded Sakel by 17% (lint) with derivatives exceeding this figure. At all 3 sites BAR XL1 outyielded X1730A though such differences were not significant. At the G.R.F., BAR XL3 was top yielder (766 lb. lint per acre) although this performance was not repeated in the southern trial. Relevant data are given in Table 3 with summarized performance for yield and spinning test figures in Tables 4 and 5.

Large scale replicated trials (Northern Gezira) run by the Sudan Gezira Board in the last two seasons have indicated that BLR 14/25 is equal to Domains Sakel in yield of seed cotton: over the 8 grades it has a slight superiority, also reflected in Shirley Institute spinning test figures. Commercial buyers have shown a keen interest in this BAR type and it would appear that its expansion and future is assured.

The Chief Cotton Examiner has reported the quality of BAR XL1 in the present season's crop as equal to that of X1730A. In view of the devastating blackarm attack at Darwish in the Central Gezira, 35,000 acres of BAR XL1 will replace X1730A in that area next season.

(b) The Tokar trial (3 varieties × 7 replications of plot size 1/10 acre) was finally planted on 4th October, earlier plantings on 15th and 25th September having been destroyed by the "hababai" wind. The trial and the surrounding area suffered severely from the wind and locusts, and plot yields were very low and irregular. The final yields, shown below, run closely parallel with that of the commercial crop, which averaged 218 lb. of seed cotton per acre.

Tokar V.T. 1954-55

	S/c lb./acre	Lint	G.O.T.
XAT1	214	69	32·2
XAT	183	59	32·1
XAG	225	73	32·3
S.E. (mean)		6	

Isolated and far from direct control, Tokar presents a problem and it is debatable whether with a diminishing staff further trials are warranted. The "acclimatization" policy is simpler and can be carried out by those on the spot.

Miscellaneous.

(a) The absence of bees and insect pollinators within the Gezira has been noted in previous Reports and a "vicinism" experiment has shown that wind assists very little in gene flow.

TABLE 4.

SUMMARY OF PERFORMANCE OF CURRENT STRAINS IN GEZIRA VARIETY TRIALS UP TO AND INCLUDING SEASON 1954-55.

Variety	Basic Type	Seed Cotton (lb./acre)						Lint (lb./acre)						Location
			Mean			Variety as % of			Mean			Variety as % of		
		No. of Trials	Variety	X1730A	Dom. Sakel	X1730A	Dom. Sakel	No. of Trials	Variety	X1730A	Dom. Sakel	X1730A	Dom. Sakel	
Domains Sakel	S	16	1263	1268	1263	100	100	16	407	458	407	89	100	Northern Gezira
BLR 14/25	S	5	1494	1498	1534	100	97	5	482	549	509	88	95	
BLR 14/25.2	S	2	1397	1572	1527	89	91	2	442	569	493	78	90	
BLR 14/25.3	S	1	1571	1721	1693	91	93	1	503	613	553	82	91	
X1730A	L	16	1268	1268	1263	100	100	16	458	458	407	100	112	
X1730L1	L	12	1297	1362	1354	95	96	12	466	491	443	95	105	
X1730L3	L	3	1526	1551	1578	98	97	3	545	560	521	97	105	
Domains Sakel	S	29	1472	1739	1472	85	100	29	466	613	466	76	100	Central Gezira
BLR 14/25	S	5	1457	1456	1222	100	119	5	458	524	399	87	115	
BLR 14/25.2	S	2	1867	1837	1674	102	111	2	572	647	532	88	107	
BLR 14/25.3	S	1	2127	2099	1642	101	129	1	634	720	514	88	123	
X1730A	L	29	1739	1739	1472	100	118	29	613	613	466	100	131	
X1730L1	L	13	1606	1505	1237	107	130	13	568	540	398	105	143	
X1730L3	L	3	1548	1412	1081	110	143	3	540	500	351	108	154	
Domains Sakel	S	12	1244	1408	1244	88	100	12	398	499	398	80	100	Southern Gezira
BLR 14/25	S	5	1061	1134	924	94	115	5	324	398	294	81	110	
BLR 14/25.2	S	2	1598	1821	1610	88	99	2	487	636	511	77	95	
BLR 14/25.3	S	1	1674	2042	1615	82	104	1	511	715	515	71	99	
X1730A	L	12	1408	1408	1244	100	113	12	499	499	398	100	125	
X1730L1	L	12	1332	1222	1006	109	132	12	464	429	325	108	143	
X1730L3	L	3	1295	1132	839	114	154	3	327	397	266	82	123	

TABLE 5.

SUMMARY OF SPINNING TEST REPORTS ON CURRENT STRAINS IN GEZIRA VARIETAL TESTS, 1942-43 TO 1953-54.

Variety	Type	Effective Length 32's			Standard Hair Weight			Corrected Lea-Strength Products.					
		No. of Trials	Mean		No. of Trials	Mean		No. of Trials	Means of 80's Counts		No. of Trials	Means of 100's Counts	
			Variety	Dom. Sakel		Variety	Dom. Sakel		Variety	Dom. Sakel		Variety	Dom. Sakel
BLR 14/25	S	9	47·1	45·7	9	148	150	9	2514	2512	9	2237	2229
BLR 14/25.2	S	3	47·7	46·0	3	145	147	3	2513	2449	3	2274	2228
BLJR 14/29	S	3	47·7	46·0	3	161	147	3	2298	2449	3	2046	2228
		No. of Trials	Variety	X1730A	No. of Trials	Variety	X1730A	No. of Trials	Variety	X1730A	No. of Trials	Variety	X1730A
BAR 1730L1	L	23	46·4	46·0	23	163	163	31	2059	2062	22	1819	1835

To assess the effects of crossing within a very regular strain, random crossings were made within BAR 7/8.2 *hirsutum* (Shambat 1953-54). At the same time a parallel series of selfed and natural plants were taken from the same area. The yields from these 3 lots of seed (Medani 1954-55) are shown below together with pertinent data on seed characters.

BAR 7/8.2

Selfed *v.* Natural *v.* Crossed

	S.	N.	C.	S.E. (Mean)
Weight/loc gms.	0·93	0·94	0·95	0·009
Ovules/loc	7·53	7·58	7·56	0·076
Seeds/loc	7·28	7·39	7·30	0·063
Mote %	3·3	2·7	3·5	0·25
G.O.T.	37·8	37·9	38·0	0·20
Seed wt. gms.	7·8	7·8	7·9	0·08
Lint index gms.	4·7	4·7	4·8	0·05
Yield s/c lb./acre	1500	1538	1713	44

Crossed seed has outyielded natural by 11%, a highly significant difference, while the components of boll weight and loc numbers per boll were extremely regular. It would appear that the extra yield obtained from crossed seed has been derived from an increased *number* of bolls per plant. Unfortunately, average boll numbers per treatment were not recorded.

Before these results came to hand it was agreed to brush-pollinate two strains of L cotton (*G. barbadense*), BAR 5/6 and BAR 4/16. Natural and selfed seed of each strain was available from the previous season: this was replicated in blocks and the three treatments selfed, natural and brush-pollinated were superimposed on the original four seed types.

It will be interesting to follow the subsequent yield behaviour of these treatments to see if brush pollination has in fact boosted yield. If considerable increases are obtained by this method the brush technique on a new nucleus going into commercial cultivation has a practical application. How long such a boost will last will be determined by future experiments.

(b) With sufficient seed now available of BLJR 14/36, a blackarm resistant Sakel homozygous for B_2 B_3 H_1 and carrying the Ferguson intensifier complex, a small-scale trial was laid down in which a direct comparison with Domains Sakel could be made. Spinning test data are not yet available but the yield figure and G.O.T. from this hairy Sakel are disappointingly low.

	S/c lb./acre	*G.O.T.*	*Lint lb./acre*
Domains Sakel	1,443	32·1	459
BLJR 14/36	840	30·2	246

(c) Following the previous year's work on American types, Hopi Acala and Punjab 268F were selected as being the two most promising types for Gezira conditions. For record purposes their bulk yields at 2 sites are shown below:

	Hopi Acala		*Punjab 268F*	
	G.R.F.	*Wad En Nau*	*G.R.F.*	*Wad En Nau*
Area (acres)	1/8	40	1/8	50
Yield s/c lb./acre	1,800	1,540	1,766	2,077
Yield lint lb./acre	581	541	611	759
G.O.T.	32·3	34·0	34·6	35·4

Cotton Propagation.

(Mohammed Eff. Taha el Faki)

Large scale propagation and nucleus rogued areas grown throughout the Sudan are listed below:

(a) Blue Nile Province:	BAR XL3	8 acres at Abu Guta
	BAR 4/16	2 acres at Abu Guta Prison Farm
	BAR 7/1.2	7½ acres at Tozi
	Stormmaster	1/10 acre at Tozi
	Hopi Acala	5 acres nucleus within 40 acres Wad En Nau
	P268F (special)	2½ acres Wad En Nau
(b) Kassala	BAR XL1	5 acre nucleus surrounded by 111 acres from BAR XL1.R (R) seed
	BAR XL1	1,064 acres from BAR XL1.R seed
	BLR 14/25	240 acres at Tendelai
	BLR 14/25.3	50 acres at Tendelai
(c) Tokar	XAT1. XAT	400 acres XAT surrounding 80 acres XAT1 nucleus

(d) Northern Province	Wilds SUS 16/1	5 acre nucleus within 20 acres at Shendi
(e) Kordofan	BAR 7/8.1	3,284 acres with nucleus rogued area of 240 acres at Semeiha
(f) Equatoria	BAR 11/5	75 acres for maintenance at Yambio

PUBLICATIONS.

(1) "Bagging Cotton Flowers for Breeding. A Special Use for Paper Bags in Selfing and Crossing". Saunders, J. H. Empire Cotton Growing Review. July 1955.

(2) "A Selfing Technique Especially Suitable for Rain Grown Cotton". Low, A. Empire Cotton Growing Review. July 1955.

SHAMBAT STATION

BY

S. O. S. DARK AND J. H. SAUNDERS.

METEOROLOGY.

Rain commenced early in July and continued until half way through September. The total rainfall for the season was 10·2 ins.

The monthly mean maximum ranged from 105·1° F. in May 1954 to 86·7° F. in January 1955, with a mean maximum of 96·6° F. for the year.

GENETICS.

Production of "Egyptian" Varieties Resistant to Blackarm and Leafcurl.

Domains Sakel Derivatives—BLR 14/25.3 (B_2B_3 + leafcurl resistance). A propagation area of approximately 7 acres was sown in October with conditions to encourage leafcurl attack. (See last season's Report, p. 12.) Only 18 plants developed primary leafcurl symptoms.

After cutting-back and culling for leafcurl, only 4% of non leafcurl plants remained and many of these were sterile. From an individually picked "filter" selection of 2,000 plants only 4 remained free from leafcurl. The distribution of the surviving plants in the field makes it doubtful whether they had true resistance to leafcurl but natural seed was harvested from them for a further test.

Other Blackarm Resistance Transferences to Sakel and X1730.

A bulk of homozygous F_3 lines was selfed to produce seed for test at Medani next season of BAR 4/16 to which the *arboreum* intensifying gene B_{6m} has been added. The line is thus homozygous for B_2 B_3 B_{6m}. The BAR 5/6 transference is one generation behind this; F_2 plants were selfed to produce F_3 lines homozygous for B_2 B_3 B_{6m} R_2^{RS} next season.

The transference of B_{6m} to BLR 14/25 was restarted from stored 1952 seed (see last season's Report, p. 13). After one further backcross this material should be ready for selfing out.

Further work is necessary with the blackarm resistance transferred to Sakel from *G. herbaceum* as last year's gene homology tests showed that two genes were present when one had been expected.

Production of Blackarm Resistant Strains of American Upland.

Transferences involving B_{6m}. In the transference of the *arboreum* blackarm resistance intensifying gene B_{6m} from synthesized Sakels to BP52 derivatives the last backcrosses were made this season to C(54)8, 13, 26 and 30 preparatory to selfing out. The transference to BAR 11/7, BAR 7/8.1, BAR NT 96.1, BAR 10/3, BAR 20/1 and Wilds SUS 16/1 continues.

BAR 7/8.2. The ½ acre sown from the 21 nep free plants (1953-4 Report, p. 13) was carefully examined and as no nep free plants could be found the project was abandoned.

Jassid Resistance.

The transference of sufficient hairiness from *G. hirsutum* stocks to *G. barbadense* to confer jassid resistance has reached the stage when four lines have been chosen from the breeding plots for inclusion in variety trials at Medani next season. Two of these stocks have their main hairiness gene H_1 from Tanguis reinforced with minor factors from Ferguson. The other two have H_1 and also minor genes from MU8b. Out of season a bulk of equal parts of these stocks was sown for mass mixed hand pollination. The seed from this will make a 5th line for testing and selection.

The transference of full MU8b hairiness to Sakel in all lines is not yet completed. Transference of jassid and blackarm resistance to Wilds SUS 16/1 also continues.

Investigations into the genetics of hairiness this season suggest that the gene H_1 is not the only major gene concerned in the distribution of hair in Sakel stocks.

In the transfer of hair from Upland to Egyptian stocks attention has been concentrated on the hairiness of the lower surface of the leaf lamina, and segregation for both the H_1h_1 and H_2h_2 gene pairs has been judged on this criterion. In a Sakel stock homozygous for H_1 as so defined, three plants were selected which were densely hairy on the under surface of the leaf lamina but only moderately hairy on the veins and apparently glabrous on the stem and petiole. These were selfed and progeny grown. Two bred true. The third segregated into three classes as follows:

No. of plants	*Lower leaf lamina*	*Leaf main vein*	*Petiole*	*Stem*
9	max. hair	max. hair	max. hair	max. hair
17	max. hair	moderate hair	moderate hair	moderate hair
8	max. hair	nearly glabrous	glabrous	glabrous

It thus appears that hairiness of the vascular tissue is not necessarily associated with hairiness of the leaf lamina, but is governed by a distinct major gene which segregates in a 1:2:1 ratio. To this gene it is proposed to assign the symbol H_3.

This investigation is being continued and it is proposed to limit the definition of H_1 to control over the hair of the lower lamina; the presence or absence of hair on the vascular tissues, i.e., veins, petiole and stem, being due to a gene pair, H_3h_3 respectively.

Yield.

The transference of 4 and 5 loculed bolls from Ferguson, Stoneville 20, Clevewilt 7, Punjab 268F and 244F and Pubescent T611 to BLR 14/25 is proceeding. F_3 lines from the 7th backcross in the Ferguson transference will be examined to see at what level the percentage of extra locs can be stabilized.

Selection within lines for increased ovule number derived from crosses between *G. "auritum"* and BLR 14/25 has continued. Two families (both 3rd backcrosses to BLR 14/25) have been studied in detail. One family N39/54 shows a 5% and the other N40/54 a 9% increase in mean ovule number over the control BLR 14/25 mean. N39/54 has a mean maximum lint length of 44·2 mms. and N40/54 a mean maximum lint length of 44·6. Individual plants have lint lengths of up to 48·0 mms. with high ovule number. Family bulks from these two lines are to be tested at Medani in the coming season

against BLR 14/25 to determine whether the present level of increase in ovule number has any advantageous effect upon yield. Since it is believed that ovule number inheritance is polygenically controlled further increases will be sought by the combination of separate lines in order to bring together as many factors for increased ovule number as possible. Selection for lint length will accompany selection for higher ovule number.

Type Collection.

G. barbadense perennials and *G. hirsutum* race *punctatum* stocks other than those from the centre of origin were grown at Medani and surveyed. The *G. barbadense* perennials gave very poor germination, many lines being lost completely.

Exploitation of Wild Gossypium Species.

G. thurberi.—The work on transference of high lint strength was continued, using BLJR 14/29 as backcross parent.

G. anomalum.—The F_1 of the second backcross to BLR 14/25.3 has been selfed in order to reveal any recessive factors which have been transferred.

Self bred seed of most of the hexaploid and synthetic tetraploid stocks involving wild species has now been obtained in sufficient quantity for maintenance.

Bollworm Resistance.

In the transference of resistance to pink and Egyptian bollworm from *G. thurberi* to BAR 11/7 the selfed and backcrossed families obtained from last season's 15 best individual plants were all scored for bollworm infestation. A score was obtained for each plant by awarding one mark for each healthy loc and half a mark for each partly diseased loc, and expressing this as a percentage of the total locs counted on the plant. A plant scoring over 60% was considered to be resistant. The F_2 families gave approximate 3:1 ratios of resistant to susceptible plants and the backcrosses 1:1 ratios. Two of the F_2 families with their corresponding backcross families are shown in the table below together with the best and worst control rows:

Parent plant		*F_2 No. of plants*			*Backcross No. of plants*	
Score	*Family*	*Res.*	*Suscep.*	*Family*	*Res.*	*Suscep.*
58%	PE 7/54	68	23	PE 22/54	5	5
67%	PE 15/54	25	7	PE 30/54	5	0
BAR 11/7 control best row		6	14			
BAR 11/7 control worst row		0	20			

The distribution of healthy and damaged locs on the best 2 selected plants together with the average for the control rows (200 plants) and the best and worst control plants is given below:

	Healthy locs	*Partly diseased locs*	*Fully diseased locs*	*Plant score*
BAR 11/7 (av. of 200 plants)	30·47	34·02	35·34	48%
BAR 11/7 (2) 5	10	20	75	19%
BAR 11/7 (6) 1	128	82	42	67%
PE 10/54 15 F_2	155	32	6	89%
PE 20/54 7 bc	129	33	20	80%

In the transference to BLR 14/25 it seems very probable that the resistance factor has been lost.

In transferences involving *armourianum* via the hexaploid *G. armadense,* the sterility prevented any successful backcrossing and the best plants were continued from natural seed.

Improvement of Lint Quality and Strength of BAR 11/7 and BAR 7/8.2 by Introgression of Hopi Acala Factors.

Two isolated plots were sown, one of $\frac{1}{4}$ feddan with BAR 7/8.2, and one of $\frac{1}{8}$ feddan with BAR 11/7. Spaced equally amongst the plants were sown holes containing the corresponding F_1 hybrids with Hopi Acala. These consisted of 10% of the BAR 7/8.2 population and 5% of the BAR 11/7 population, these values being based upon the quantity of hybrid seed available.

The hybrid plants were marked and allowed to interpollinate freely with the surrounding population. Their seed was harvested separately as single plant units for use at Medani. The bulks of the remaining populations were harvested and sent to Kadugli for growing on in isolation plots.

Leafcurl.

Since "filtering" has not developed the desired leafcurl resistance in Sakel stocks, experiments were carried out to improve the technique of selecting plants resistant to this virus disease. The stages of development of the disease in plants of different ages were followed, and the subsequent development of the disease in the cut back plants was being studied until a swarm of locusts ate all the material.

Many of the observed differences in severity of leafcurl attack seem to be due less to the variety of cotton attacked than to the stage of development of the plants at which the attack by infected whiteflies becomes effective.

A system is now being developed by which families under test are first infected by a whitefly attack. Apparently resistant plants are then budded with buds taken from leafcurl carrying plants. In this way it will be known that any resistant plant has actually been subjected to infection.

Grafting and budding experiments are being continued with wild *Gossypium* species in order to determine their reaction to leafcurl infection. All those so far tested have been susceptible to the disease.

Use of Paper Bags in Crossing and Selfing.

A statistically analysed experiment has shown that paper bags used in the process of selfing and crossing Sakel flowers achieve their purpose of protecting the seed from bollworm attack. In both crossing and selfing the use of bags gave an increase of 16% in the numbers of undamaged seeds obtained.

In selfing the use of bags increased the percentage of bolls set by 13 and in crossing the increase was 31%.

Next season a trial of Endrin treated bags will be made to see whether this will further reduce the bollworm attack.

The bags seem to have an especially beneficial effect on the set of bolls obtained from crosses, probably because they make a good substitute for the perianth of the flower which is removed during emasculation.

Disease and Pests.

Pink and Egyptian bollworm as usual in Shambat produced a very heavy attack. Blackarm was widespread and severe in the early season, but during the cool winter weather it was almost impossible to get the disease to 'take' on the demonstration plots.

At the end of May a swarm of locusts ate off all remaining cotton plants, ruining the leafcurl experiments and some extra out-of-season propagation plots.

In the wild cotton species garden at Shambat a curious appearance was noted on a fine specimen bush of *G. armourianum* in November, 1954. The centre of the bush contained a single side branch with a solid bunchy appearance of the foliage. Examination showed that the internodes of the twigs were shortened, that the leaves were dwarfed to about one-third of their normal diameter, and that the shortened tip of each twig had died back.

Mon. R. Delattre, the entomologist from the I.R.C.T. Station at Bouake, examined the plant and considered that the appearance was similar to that of a disease causing considerable trouble in the Allen cottons of the Ivory Coast. The Ivory Coast disease is thought to be caused by virus but this has not yet been isolated and artificially transmitted.

The branch was cut out and burnt and careful watch maintained on the rest of the bush but so far no further symptoms have developed.

KADUGLI STATION

BY

M. F. ROSE AND A. LOW.

The Commercial Crop.

The rains generally were only average: the establishment of the crop was difficult and there was much re-sowing. The variation in growth typical of Nuba Mountains cotton was very pronounced, cotton growing from six inches to six feet. Yield response was likewise variable, but on the Kamina Farm returns were of the order of 1,300-1,500 lb. of seed cotton per acre.

The early estimate of a record return of a million small kantars* was revised in the light of the total rainfall and its distribution. The final assessment was 800,000, but 906,000 small kantars were marketed. This was an all-time record.

Table 6.

Rainfall, Nuba Mountains, 1954.

MMS.

Station	*March*	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Nov.*	*Tot*
Kadugli	2·0	4·0	42·0	117·6	186·1	94·5	137·0	131·0	—	714
Dilling	—	24·0	39·0	50·0	202·0	162·0	162·0	75·0	—	714
Lagowa	—	53·0	42·0	79·0	174·5	113·5	143·0	131·5	—	736
Talodi	1·0	10·0	85·0	92·0	135·0	234·0	95·0	105·0	—	757
Kalogi	—	—	18·0	105·0	173·0	131·0	205·0	130·0	3·0	765
Abu Gubeiha										589
Um Berembeita	—	—	—	67·5	242·5	276·0	161·5	5·5	—	753
Abbassiya										485

Marked variability of grade and staple has always been a problem in the Nuba Mountains with its wide range of climatic and soil conditions and the present season was no exception. However, a real improvement is expected to result from the fact that the cotton marketed is now ginned in the order of purchase and by area. It is normally classified into grades I, II, III on the degree of trash and insect damage, but with pre-cleaners installed in the new factories there should be a marked improvement in overall grade.

* 1 small kantar = 100 rotls = 99 lb.

The appointment of a grader (American types) with part time duties in the Jebels and Port Sudan should also assist in the attainment of more even running lots.

Blackarm was in evidence at the end of August but the spread was not serious. BAR 7/8.1, in variety trials and as a first wave in the Kalogi-Subu area, showed marked resistance and the cultivators were well pleased with it. Other pests causing damage were Sudan bollworm, stainers, termites and in the early stages millipedes and flea beetle.

Early 1955 marked the complete re-organisation of the Nuba Mountains Cotton Industry (N.M.C.I.), Sudanese officials replacing the expatriate staff. It has been decided that the handling of the crop will continue on the same lines as in recent years; that is, the Inspector of Agriculture deals with the agriculture of all crops but not the purchase and marketing of cotton.

With the Nuba turning to cotton cultivation as well as the nomadic Arab, a state of unbalance is probable in the general agricultural economy. Dura shortage has been acute in certain areas and the Government has brought dura into the Jebels and has wisely decided to peg the issue of cotton seed to 96,000 small kantars.

Breeding.

(a) The breeding plot was sown on 7th July with 700 selections of BAR 11/7, the quality type derived from XA129 of Pump Scheme origin. These primary selections had been taken from Abu Guta in 1953-54, and before planting had been examined for yield and desirable seed characters (including seed coat nep). Droughty conditions at emergence threatened total crop loss but the seedlings were saved by hand watering.

Individual progeny rows were replicated (up to 4 replications), each replication containing 20 plants. The spacing was 90 cms. × 90 cms. with appropriate parental controls on either side of the progeny rows, as soil variation even from one row to the next is marked.

In view of the fact that the yield of BAR 11/7 is lower than that of the more robust types, a rough assessment of yield was made in this 'breeding phase' vis-a-vis that of the appropriate controls. Three groups emerged from this double filter (quality and quantity) of the following pattern:—Group A, 10 progenies of 35% lint increase. Group B, 25 progenies of 15% lint increase. Group C, 25 progenies of 5% lint increase. These 60 lots will appear in the 'testing' stage in the coming season.

TABLE 7.

VARIETY TRIALS, NUBA MOUNTAINS, 1954-55. YIELD SEED COTTON AND LINT IN LB. PER ACRE.

	Kadugli			*Talodi*			*Lagowa*			*Dilling*			*Overall Mean*		
	Seed Cotton	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T*
BAR 7/8.2	1582	542	34·3	912	310	34·1	812	294	36·2	674	232	34·4	995	345	34·6
BAR 7/8.1	1310	451	34·5	786	269	34·2	747	268	35·9	727	252	34·6	893	310	34·7
BAR 11/7	1271	383	30·2	788	233	29·6	720	230	31·9	661	208	31·5	860	264	30·7
BAR SP84	1447	438	30·2	699	202	29·0	691	224	30·9	661	201	30·5	875	266	30·4
PSS	1369	398	29·1	732	214	29·2	649	194	29·9	624	187	29·8	844	248	29·4
S.E. (Mean)		21			8			11			9				
Difference P = 0·05		60			24			32			25				

TABLE 9.

SUMMARY OF SPINNING TEST REPORTS ON CURRENT NUBA MOUNTAIN STRAINS UP TO AND INCLUDING 1952-53.

	Effective Length 32's			*Standard Hair Weight*			*Corrected Lea-Count × Strength Products.*								
		Mean			*Mean*			*Means of 32's*			*Means of 40's*			*Means of 50's*	
Variety	*No. of Trials*	*Variety*	*BAR SP84*	*No. of Trials*	*Variety*	*BAR SP84*	*No. of Trials*	*Variety*	*BAR SP84*	*No. of Trials*	*Variety*	*BAR SP84*	*No. of Trials*	*Variety*	*BAR SP84*
PSS	21	37	38	21	194	195	—	—	—	21	2210	2154	11	2040	1968
BAR 7/3	9	36	37	9	206	193	1	2179	2023	9	2010	2072	1	2020	2147
BAR 7/8	10	36	37	10	195	194	1	1937	2023	10	2051	2184	1	2016	2142
BAR 7/8.1	4	37	37	4	197	200	—	—	—	4	2043	2139	—	—	—

(b) Two thousand typical plants of BAR 7/8.1 were taken from the Semeiha nucleus and ginned (12 inch roller) at Kadugli. Excessive seed coat nep (up to 60%) is a bad defect in this strain and it was hoped to reduce this figure by straightforward selection.

275 single plants showed an incidence below 15% (maximum 40%) and seed from these plants will be bulked and sown in isolation to give 1,000 plants for the breeding phase at Kadugli in the 1956-57 season.

Testing.

Kordofan.

Variety trials, under the direct supervision of this Section, were laid down at Kadugli, Talodi, Dilling and Lagowa with planting dates on 9th, 17th, 11th and 5th July respectively. The layout was identical, 5 varieties repeated 7 times in randomised blocks. Plot size was 0·028 acres with a standard spacing of 90 cms. × 90 cms.

Because of drought, millipedes and termites establishment was difficult at all four sites. Flea beetle was in evidence at Lagowa, while some damage was caused at Kadugli and Talodi by the cotton leaf roller, *Sylepta derogata.* Sudan bollworm tended to be serious at Talodi, a fact ascribed to the poor clean-up in that area.

Yield figures are shown in Table 7.

High yields were obtained, particularly at Kadugli, where the total rainfall recorded was only average and the season definitely unfavourable at the time of establishment. These high yields were also reflected in the record market returns in the commercial crop, particularly in the Kadugli area. The superiority in yield of lint of BAR 7/8.2 and 7/8.1 was quite clear, BAR 7/8.2 this season being superior to BAR 7/8.1 at all but one site (including Darfur, Tozi and Equatoria).

A summary of performance of current strains in Kordofan variety trials (up to and including season 1954-55) and spinning test figures (to 1952-53) are shown in Tables 8 and 9.

Darfur, Equatoria, Central Rainlands Tozi.

For the first time on record, replicated trials were laid down in Darfur at Arwala and Buram. With the railway advancing west-south west from El Obeid to Nyala, potential agricultural areas will be tapped in which cotton will doubtless play a part.

TABLE 8.

SUMMARY OF PERFORMANCE OF CURRENT STRAINS IN KORDOFAN VARIETY TRIALS UP TO AND INCLUDING SEASON 1954-55.

Variety	Seed Cotton (lb./acre)				Lint (lb./acre)			
	No. of Trials	Variety	PSS	Variety as % of PSS	No. of Trials	Variety	PSS	Variety as % of PSS
PSS	71	925	925	100	62	266	266	100
BAR SP84	28	870	905	96	28	276	266	104

Variety	Seed Cotton (lb./acre)				Lint (lb./acre)			
	No. of Trials	Variety	BAR SP84	Variety as % of BAR SP84	No. of Trials	Variety	BAR SP84	Variety as % of BAR SP84
BAR SP84	32	971	971	100	32	307	307	100
BAR 11/7	4	860	875	98	4	264	266	99
BAR 7/8.1	12	814	721	113	12	276	216	128
BAR 7/8.2	8	822	713	115	8	279	213	131
PSS	28	905	870	104	28	266	276	96

The Arwala site was 43 miles S. S.W. of Zalingei and 52 miles from the French Equatorial Africa border. Buram, lying well to the south, was 85 miles S. S.E. of Nyala. Both areas have a rainfall of 700-800 mms., with the soil type around Buram very similar to that of the Nuba Mountains. Reports indicate bollworm and stainer on the local crop* (now grown for domestic consumption) but there is nothing to indicate any serious infestation at present. The position could rapidly change, however, with the development of a commercial crop around a local industry. Unfortunately the Buram trial was washed away but that at Arwala came through to give good yields of excellent quality. The latter trial was planted in mid-June and was patterned on the Kordofan layout.

At the Yambio Expt. Farm (Equatoria) two trials were planted on 16th and 18th June. The sites were described as 'good' and 'bad', the latter typical of some cotton areas. In the former the soil was a deep dark loam overlying pea iron gravel which in turn overlaid fairly moist sub-soil laterite: in the latter case the soil was a sandy loam with pea iron nodules, overlying hard laterite close to the surface. Rainfall was 890 mms. and pests and diseases had little effect on final yield.

*Locally known as 'Fantaz', a carry-over from the original introduction of PSS in 1938.

At Tozi (trial planted on 7th July 1954) pests and diseases were negligible but a high rainfall, 728 mms., of abnormal distribution must have reduced yields considerably. Much cotton was submerged by very heavy rains in August and failed to survive. For this reason two blocks in the replicated trial were abandoned.

Final yield data for the three localities are shown in Table 10.

Acknowledgment is made to the Inspector of Agriculture, El Fasher, and to the Senior Research Officers, Yambio and Tozi, for conducting these trials: also for supplying plot data and samples for spinning tests.

Miscellaneous.

(a) *Ridging versus Flat Cultivation.*

A randomized block experiment of 4 replications was laid down on 21st July 1954 to test the effect of ridges (R) and ridges tied (R(T)) against flat (control—F).

The three main treatments were split and the strains BAR 7/8.2, BAR 7/3 and PSS were superimposed. Sub-plot size was 0·04 acres with spacing standard at 90 cms. × 90 cms.

Lint lb./acre

	BAR 7/8.2	BAR 7/3	PSS	M
R (T)	486	387	387	420
R	438	394	392	408
F	527	466	399	464
M	484	416	393	431

In view of the peculiarity of the Kadugli season in terms of the total rainfall and distribution, also with an atypical sandy soil on which the experiment had to be carried out, the results shown above must be regarded with caution.

'Flat' just failed to reach significance over the other two treatments while in sub-plot comparisons BAR 7/8.2 significantly outyielded (1% level) BAR 7/3 and PSS.

Blackarm counts on the fully susceptible PSS showed no definite trends over the main treatments while sheet erosion was more effectively controlled on R (T) than on R.

It is probable that R (T) and R may be of value under the wetter conditions of the south where waterlogging is much in evidence. However, they may be distinctly disadvantageous in the northern areas where rainfall is lower and the establishment of the crop more difficult. Yield figures at Kadugli during a difficult season seem to point in this direction.

TABLE 10.

VARIETY TRIALS (OTHER AREAS), 1954-55.

YIELD SEED COTTON AND LINT IN LB. PER ACRE.

	Darfur			*Equatoria (A)*			*Equatoria (B)*			*Tozi*		
	Seed Cotton	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*	*Seed Cotton*	*Lint*	*G.O.T.*
BAR 7/8.2	1696	578	34·1	994	390	39·2	669	261	39·1	1542	530	34·4
BAR 7/8.1	1545	529	34·2	940	370	39·2	587	232	39·4	1455	490	33·7
BAR SP84*	646	187	28·9	825	286	34·6	541	189	35·0	1264	387	30·6
BAR 11/7	1353	436	32·2	—	—	—	—	—	—	1222	383	31·3
BAR 11/5	—	—	—	930	325	34·9	493	175	35·7	—	—	—
PSS	1339	408	30·5	—	—	—	—	—	—	1221	350	28·7
S.E. (Mean)		17			9·1			20·2			16·2	
Difference required at 5% level		51			26			61			48	

NOTES. YAMBIO { Equatoria (A)—Good site—Deep dark loam overlying moist subsoil laterite.
Equatoria (B)—Poor site—Sandy loam on gravel. Hard laterite close to surface. }

* Figures suspect for Darfur BAR SP84.

In the 1955-56 season the experiment will be repeated both at Dilling and Talodi, at the extremes of the rainfall range.

(b) *Perecot Treated Seed.*

In conjunction with the Field Division, 'Perecot' treated seed was planted on land ranging from newly-opened up or 'harig' to old continuous cotton (3 years). There was no replication but the following observations were made: on new land 'Perecot' gave no response at all but on 3 years continuous cotton an increase in yield of 15% was estimated. Response to treatment appeared to be directly related to the period under crop.

Propagation.

The first main wave of BAR 7/8.1 from Semeiha was planted in the Kalogi-Subu area from June onwards. Unfortunately a too generous seed issue per acre reduced the effective area from 29,000 to 21,000 acres. This reduction of area, followed by admixture with BAR 7/3 on the fringe areas of Kalogi and poor returns from inexperienced cultivators in the Subu region has militated against the complete replacement of BAR 7/3 in 1955-56. Approximately two-thirds of the effective cotton area (Kalogi, Talodi, Kadugli, Lagowa and Subu) will be served with BAR 7/8.1 seed while Dilling and the north-eastern Jebels will have to retain BAR 7/3.

Semeiha was again used as the Jebels seed farm, seed from the main propagation area of 3,284 acres (BAR 7/8.1 R) being sent to Kadugli and Lagowa as the second wave.

At El Effein near Kadugli, one acre of Pump Scheme Strain was sown for type maintenance while the bulking-up of seed of BAR 11/7 (the quality type) was continued in a 2 acre isolation plot.

Appendix.

Key to Symbols Used in this Report.

Egyptian S types.

DS	Domains Sakel originally imported from Egypt.
BLR 14/25	A Sakel type carrying B_2 and B_3.
BLR 14/25.3	3rd filter.
BLJR 14/29	A hairy Sakel homozygous for B_2, B_3 and H_1.
BLJR 14/36	As BLJR 14/29 but also carrying the Ferguson hairiness complex.
G. auritum	A *barbadense* type with high ovule number per loc.
G. armadense	A synthetic hexaploid obtained by crossing *G. armourianum* and *G. barbadense* and doubling the chromosome number of this triploid.

Egyptian L types.

X1730A or XA	Successor type to X1730.
XAG	X1730A Gash grown.
XAT	X1730 Tokar grown.
XAT1	1st filter of XAT.
BAR XL1	1st filter of BAR 1730L.
BAR 1730L1	1st filter of BAR 1730L.
BAR XL3	3rd filter of BAR 1730L.
BAR 4/16	An X1730A type carrying B_2 and B_3.
BAR 5/6	As BAR 4/16 but carrying the red *arboreum* gene R_2^{RS}

American Upland.

BAR SP84	The blackarm resistant component of Uganda SP84.
BAR 7/8.1	BAR SP84 carrying B_2 and B_3 1st and 2nd filters.
,, ,, 2	BAR SP84 carrying B_2 and B_3 1st and 2nd filters.
BAR 7/3	A selection from BAR SP84 for improved G.O.T.
BAR 7/1.2	A very early component selected from BAR SP84 giving a very high yarn strength.
BAR NT96	From the cross '57 × Over-the-Top' (carrying B_2).
BAR 20.1	BAR NT96 'cluster type' carrying B_2.
Pump Scheme Strain (PSS)	An old commercial bulk deriving from Nyasaland Upland.
BAR 11/5	XA129 (PSS) carrying B_2.
BAR 11/7	XA129 ,, B_2 and B_3.
BAR 10/3	A Deltapine type carrying B_2.
MU8b	Malwa upland type (from India).
BP52	An upland type (commercial) from Uganda.
Stoneville 20	A direct importation from the Belgian Congo.
Wilds SUS 16/1	American long staple type: irrigated.
Ferguson	A hairy American type from the Philippines (via Trinidad).
Clevewilt 7	An American commercial from S. Carolina.
P268F	American importations direct from India.
P244F	American importations direct from India.
Pubescent T611	An upland cotton carrying H_2 supposed to have arisen by mutation.
Hopi Acala	A very early type directly imported from U.S.A., 1953: of high intrinsic fibre strength.

Genes.

B_1	A weak dominant blackarm resistance factor from Uganda B31.
B_2	A strong dominant blackarm resistance factor from Uganda B31.
B_3	A partially dominant blackarm resistance factor from *G. punctatum*.
B_4	A partially dominant blackarm resistance factor from *G. arboreum*.
B_5	A partially dominant blackarm resistance gene from 'Grenadines White Pollen'.
B_{6m}	A blackarm resistance intensifier from *G. arboreum*.
B_7	A partially dominant blackarm resistance gene from Stoneville 20.
b_8	A recessive blackarm resistance gene from *G. anomalum*.
H_1	A hairiness gene from *Tanguis*.
H_2	A hairiness gene from *G. tomentosum*.
H_3	A partially dominant hairiness gene controlling the distribution of hairs on the plant.

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